

*Pennoyer*

1960 ANNUAL REPORT

ARCTIC-YUKON-KUSKUNUM AREA

DIVISION OF COMMERCIAL FISHERIES  
ALASKA DEPARTMENT OF FISH & GAME

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## INTRODUCTION

The following report is a summary of biological investigations and management in the Arctic-Yukon-Kuskokwim Area in 1960. The surveys, commercial fisheries management, etc. have been broken down by major river systems into separate chapters. The Kanektok, Yukon, and Kuskokwim Rivers all have fisheries prosecuted within their mouths and can therefore be treated as totally separate entities. Their size also demands individual treatment.

In general, 1960's work can be divided into three phases. One, management of the commercial fisheries in the Yukon, Kuskokwim, and Kanektok Rivers, which consisted of closing various areas when they reached their respective quotas and compiling catch statistics. Two, certain specific projects such as the Kuskokwim subsistence survey and the counting tower on the Kanektok. The largest part of the field season, making up the bulk of this report, was spent in general surveys of the drainages in the area. This included aerial and ground surveys of streams; interviews with interested people; boat sample netting; documentation of subsistence catches, etc.

The field season staff consisted of one permanent biologist and three biological aides.

KANEKTOK RIVER

1960

The Kanektok is a clear water stream draining from the Abklun Mountains into Kuskokwim Bay. It is some 80 miles in length from its mouth to its source in Lake Kagati. The area drained varies from mountains of apparently volcanic origin at the head to tundra for the lower one-third of the river's length. The whole drainage is treeless, scrub willow and alder being the largest form of vegetation.

The elevation at the lake is approximately 1000 feet above sea level. Within 25 miles this drops to 500 feet and then more gradually to the ocean. At no point, however, could the drainage be considered precipitous. There are no barriers to fish migration in the main river. Flow, while subject to considerable rises and falls due to rains in the hills, remained adequate throughout the summer and was never seen to become a "raging torrent." The water remained clear through most of the summer, except for one or two times when it became roiled after heavy rains. Only once did it become muddy to the point that one could not see into it to any depth.

The river was some 120 feet wide at the counting tower site, 6 miles upstream from the mouth. It varied from 1-3 feet deep in the riffles to 10-12 feet deep in the pools. It is navigable by river boat with motor lift for a distance of at least 18 miles upstream from the mouth. Water temperature of the river varied from 46-52° F. at 5:00 P.M. through the summer.

There are four major tributaries to the Kanektok, Takashilik Creek, Nukluk Creek, Klik Creek, and Kamuktik Creek. Only one of these supports a lake system of any size and that is Kamuktik Creek.

Rainbows, grayling, sticklebacks, cottids, and perhaps Arctic Char are the only species known to be resident in the river.

The migratory fish include all five species of Pacific salmon, arctic char or dolly varden and smelt. Whitefish may enter the river, but none have been seen by this biologist. Whether the steelhead form of rainbow is present or not is not known either. I am told that neither burbot nor lamprey enter the stream.

Breakup may occur at any time from April 20 to May 14. By May 29 of this year, char had entered the river in some numbers, and many of the village people at Quinhagak were sport fishing for them and grayling.

On June 6, of this year a counting tower was installed 6 miles above the mouth of the river. The site chosen was on a gravel bar facing NW on the south side of the river. The stream at this point is approximately 120 feet wide sloping gradually from 0' on the S. side to some 10-12' deep on the N. side. The North bank is steep and some 3-5 feet high. The current is swiftest approximately 3/4 of the way across from the S. bank with many eddy areas along the N. bank in deep water--a fact not realized during the tower installation.

The tower itself is a 20' high Beatty tubular aluminum scaffolding. It breaks down into pieces small enough to fit into a Goose and weight is only 134 pounds. Installation is fairly easy, and the only problem occurs due to the lightness of the structure. It requires a great deal of guying to prevent swaying in high winds. Background panels were made of 4" mesh heavy hog wire. This wire came in 100' rolls about 2½' high and weighing some 450 lbs. It was painted light green and was very effective. Problems stemmed from trying to install the wire in one piece. It would certainly be more effective in the future to cut the wire into, 8 or 10 foot panels, and install them one at a time. Devices similar to the stakes and crosspins used at Bristol Bay will be used in the future to hold the panels in place. Attempts to install a riffle-dumper and flutterboards met with failure. In Bristol Bay, 200-pound Navy anchors are used, and an attempt will be made to secure at least one of these this fall. The flutterboards were installed off the N. bank to tighten fish

oward the S. bank panels. Wires with pieces of wood painted white twisted onto it was used. At first it seemed to work, but at the peak of the run it did no good and fish migrating up the N. bank side were soon to pass slowly over and under it. A beach seine will probably have to be used in the future as a deflector.

Visibility from the tower was greatly hampered by wind and rain for at least 17 days from June 29 through August 3. Another difficulty was encountered due to the positioning of the tower. Since it faced roughly NW. the 5 to 8 P.M. counts were made in poor visibility. Also, the depth of water on the N. bank greatly hampered counting there, especially at night. Though a watch was kept, no fish were seen migrating up the north side until July 11. Counts on the N. bank were not commenced until July 19.

Funds were available for only 2 temporary employees to man the tower. This was too small a crew for the work load. Counts were missed, and 5 days were lost in the construction of a second tower on the opposite bank. Materials had to be secured from the coast, and it required both men to handle the heavy drift logs needed. Though David Schwab and Ray Duguque did a creditable job in pioneering a new management project, any future crew will have to consist of at least 3 men.

Though the tower counts did not give an absolute count of the number of fish migrating upstream, it did give a good indication of timing and duration of runs, and at least a minimum count on chums and rods. The king count was not even an indication of the size of the run, as most of the kings seemed to migrate outside of the background panels.

Counts were scheduled for ten minutes out of every hour, 24 hours per day. When counts were being made from both banks, after July 19, ten minutes were to be counted on each side every hour. These 10-minute counts were expanded to hourly totals. Where one count out of ten was missing, it was estimated by averaging the hourly count on either side of it. However, when whole days or large portions of several days in a row were missing, no attempt was made to estimate the number of fish not counted. On this basis estimates are available

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for 322 of the total time between June 29 and August 5. Figures for this period of time will be given under the discussion of each species.

The first fish to appear off the tower were smelt (Thelichthys pungitius) at 4:00 P.M. on June 6. At that time, it was estimated that 2400 fish were going past the camp every five minutes. They ran until June 11, when they were observed to be dying off.

Kings did not appear off the tower in large numbers until June 28. Some may have passed previous to this, since actual counting did not commence until June 29, due to high water and difficulties with the background panel. Counts from the tower were extremely inconclusive as the kings seemed to pass upriver in deep swift water out beyond or at the tip of the counting panel. However, the three airplane surveys made give some insight into the progress of the king run. The surveys were made by a pilot, Charles P. Allen, and an observer (myself) in a Cessna 180. On July 3, 1960, the lower 55 miles of the river were surveyed. Above this there were no fish. Only 350 kings were counted in the river. They were solitary, spread out and not spawning. On July 20, another survey was made from the air. This survey covered the whole length of the river from 4 miles below the lake where the first kings were seen to the mouth. 6,047 kings were counted. Nearly all were spawning and there were many carcasses present. This number is a fair estimate, but may be a little low due to the confusion generated by trying to count vast numbers of chums and reds at the same time. The river was flown once more on August 19 for its full length. An accurate count was made only for the lower 25 miles, and in this stretch there were at least 140 spawning kings. Above this kings increased in density if anything, except for a gap above Nakailingak Creek for about 12 miles in which there were very few fish. Many spawning kings (est. 3-400) were seen in the river from Paiyun Creek up to the lake, approximately 10 miles. There were more carcasses than live fish in the river.

Chums started running in large numbers later than the kings, but the main peak on the spawning beds seemed to coincide with that of the kings. Chums were first seen off the tower on June 29. They reached a peak about July 9 and ran in a sustained peaking until at least July 26, after which their numbers started to drop off. Peaks subsequent to July 9 are ill defined due to missing counts. Chum carcasses in quantity were first noted on July 28, and increased in number after that. In the 32% of the time for which counts were available, 64,355 chums were estimated to have passed the tower between June 29 and August 5. Aerial surveys revealed 10,000 chums in the river on July 3, with many of the fish near the mouth in schools, and not any fish above Nakaitingak Creek. On July 20, about 36,000 chums, mostly spawners, were counted from the air between the lake and the mouth. This count represents a bare minimum estimate of all fish present as most of the attention was given to kings and reds. Also, every side channel and slough seemed to be filled with spawning chums and counts in these areas were often missed. Carcasses were not counted, but were very numerous. Carcasses and live fish probably in actuality numbered more than 100,000 fish. The August 19 aerial survey revealed 370 spawning chums and several times that number of carcasses, in the lower 25 miles of the river, in addition two or three thousand spawning chums were estimated in the 10 miles of river directly below Lake Kagati.

Red salmon first put in a countable appearance at the tower on July 9 and by July 19, were running heavily. They were still passing, though greatly reduced in numbers, on August 5 when counts were suspended. They may have been running earlier than June 9 though catches downstream did not reveal this, since during the whole of their run they were interspersed between large numbers of chums, and the separation of species in the count until the chums actually started to spawn was often a matter of conjecture. The available tower count estimates (32% of run time) showed a minimum of 35,921 reds passing the tower from June 29

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to August 5. The aerial count on July 3 showed no reds that could be identified as such in the river. On July 20 there were at least 34,900 reds in the river between the mouth and Lake Kegait. An additional 4000 reds were counted in the lake itself. None were spawning on this date. On August 19, 2700 reds were counted by air in the river, mostly right below the lake, though some were seen as far down as 50 miles below the lake. Some 31,650 reds, mostly spawning, were counted in the lake itself. However, the count was made in very poor visibility with a great deal of wind disturbance on the lake surface. Schools were glimpsed in places where counting was impossible due to poor visibility. On August 3, Dean Paddock from Bristol Bay estimated 100,000 reds in the lake. On August 24, at 1:00 P.M., Chuck Mencham and Walt Kirkness estimated 77,000 reds in the lake. They also saw many spawning dogs and carcasses downriver 10 miles.

Pink salmon appeared in the count on July 18, but were of minor importance compared to other species. Only 13,550 were estimated to have passed the tower during counting periods. Local information has it that there is a large run of pinks every three years and that the last was in 1958? They claim that next year will be a pink year.

Silvers were not reported until August 3; only 420 were counted from the air on August 19. All these were schooled, and all were in the lower 15 miles of the river. The townspeople say they run well into October with the peak at the mouth around September 15.

At the mouth of the Kanektuk is the village of Quinhagak. It is a picturesque town of some 250 people, including a BIA teacher and his wife and a Moravian Missionary. The missionary is a Rev. Michael. The town council chief's name is Sam Fullmoon. Adolphe Johnson is the National Guard leader in town. He also runs a small freighting business between Quinhagak, Bethel and Platinus.

These people are rather unique in the Arctic in that they possess a fair amount of cash. Most of the men work in the Prudhoe Bay canneries during the summer. This greatly influences their subsistence fishing habits. They fish the first part of the king salmon runs for their own use, go to the canneries, and come back in time to fish the silver salmon run for their own use. This year subsistence catch forms were distributed throughout the town and when returned indicated that 9393 silvers had been taken. It is not known whether this is a complete count.

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## KUSKOKWIM RIVER

The next major coastal stream mouth of the Knikoktok is the Kuskokwim River. This river is the second largest in Alaska. It originates on the north slopes of the Alaska Range and runs in a southwesterly direction over 665 miles to its mouth in the Bering Sea.

This is an extremely silty river as most of its upper tributaries are glacial. Only in the winter when ice covers the river does it become relatively clear-bottom visible at Aniak to depth of over ten feet in December. Flows at Crooked Creek in 1956-57 varied from a mean in January of 9,300 cfs to a mean in May of 161,700 cfs with a yearly average of 40,620 cfs. Thirteen major tributaries feed the Kuskokwim, varying in length from the 55 mile long George River to the 153 mile long Stony River. Each of these will be examined in turn later in the report.

The following is a list of fish known to occur in the Kuskokwim and its tributaries:

King Salmon	<u>Oncorhynchus tshawytscha</u>
Chum Salmon	<u>Oncorhynchus keta</u>
Red Salmon	<u>Oncorhynchus nerka</u>
Silver Salmon	<u>Oncorhynchus kisutch</u>
Pink Salmon	<u>Oncorhynchus gorbuscha</u>
Arctic Grayling	<u>Dingillus signifer</u>
Rainbow Trout	<u>Salmo gairdneri</u>
Lake Trout	<u>Salvelinus namaycush</u>
Arctic Char and/or	<u>Salvelinus alpinus</u>
Dolly Varden	<u>Salvelinus malma</u>
Inconnu or Sheen	<u>Stenodus leucichthys</u>
Round-nosed whitefish	<u>Coryphaenoides nasus</u>
Lake Herring	<u>Gasterosteus aculeatus</u>
Lake Whitefish	<u>Coresomus clupeaformis</u>

Round Whitefish	<u>Prosopium cylindraceum</u>
Northern Pike	<u>Esox lucius</u>
Blackfish	<u>Dallia pectoralis</u>
Lamprey	<u>Euteleophorus sp.</u>
Sucker	<u>Catostomus sp.</u>
Ling or Inch	<u>Iluca lura</u>
Cottids	<u>Unknown sp.</u>
Smelt	<u>Thallichthys pacificus</u>

The non-resident fish of this river include the salmon, perhaps some of the whitefish and some of the sheefish, the lamprey and smelt. It is not known at this time if the rainbow trout in the river are present as steelhead. The whitefish and sheefish display annual upstream migrations or movements. These movements are reflected in catches all year, but mainly in the spring and fall. Whether these fish are anadromous in the Kuskokwim or merely move from the main rivers up the side streams to spawn, is not known. The burbot or ling also display definite migratory habits. They are taken moving upstream in large numbers in the winter under the ice. It is not known from where the ling come or to where they go in this system.

The first migratory fish to make its appearance in the river is the smelt, Thallichthys pacificus. They started running at Bethel around May 26 this year and by the 29th started slackening off. The people here take them with dipnet. These fish penetrate upstream only as far as Kalskag.

King salmon enter the river shortly after breakup, generally appearing at Napakiaik between May 25th and June 1. Since complete, documented daily catch records are not available on this river, the timing of runs for all species is still mainly guesswork and hearsay. However, it will be presented here "for the record". (Hearsay indicates kings started at Napakiaik on June 1, peaked about June 15th and seemed to be finished around July 1). This year kings appeared at Bethel on about June 1st and seemed to be peaking around June 14th.

The limited commercial fishery, 3,000 king quota from the mouth upriver to Akiachak, closed on June 15th, just at the time the run seemed to be on the upswing and consequently did not present a very good picture of the run. The main run at Bethel appeared to be over around July 1. Kings arrived at Aniak, 161 miles above Bethel around June 6th. This seems to indicate a rate of travel of about 27 miles per day. However, since these records are dependent on irregular native fishing effort, they cannot be considered reliable, and only an intensified tagging program will accurately reveal timing for any of the salmon species in the river. (Scale samples are still being analyzed so no data is currently available on age and sex). Neither has downstream migration been pinpointed. On July 3, kings were still being taken at Aniak. One night's set net catch yielded 6 kings, 3 of which were red. Kings at Aniak first appear on the north side of the river and apparently are bound for far upstream spawning grounds. Those heading up the Aniak and probably other south side spawning tributaries seem to peak at Aniak (on the south side of the river) on July 3rd and 4th. On June 19th at Aniak fishermen were taking kings, chums, reds, and sheefish.

Chums first appeared at Napaklik between June 10th-15th and had passed the peak, but were still running strongly on July 6th (2 drifts of 1 hour apiece produced 51 chums and one night's set netting produced about the same). Chums were said to first appear at Aniak on June 19th and peaked there on July 15th. On July 27th, they were still running strong, but catches had pretty much dropped off by August 14th. This is undoubtedly the largest single run of salmon on the Kuskokwim. Jimmy Kvassie caught up to 176 chums per day (July 15) in his fishwheel at Aniak. One fisherman at Napaklik stated that he took about 10 chums to every red caught.

Red salmon started running at Napaklik about the same time as the chums and in general the timing of this run coincides with that of the chums.

Silvers were said to first appear at Bethel on August 1. They reached Aniak on Aug. 3rd. They contribute to a considerable sports fishery at Aniak. The silver run takes place during the rainy season, and therefore these fish are utilized very little by the subsistence fishermen who must dry their fish for preservation over the winter. This, of course, means that very little is known of the silver run except that it is probably vastly underutilized.

The pink salmon run in the Kuskokwim is so minor that many residents were unaware that this species existed in the river. Some are taken annually at Aniak.

Many stream surveys were flown in the summer of 1960, and a great deal of information was acquired on Kuskokwim tributaries. Starting at the mouth the

The rivers and streams on the north side of the Kuskokwim as far upstream as Kalskag seem to be merely drainage sloughs for the great tundra and bog area of the Yukon and Kuskokwim delta. As such, and from information picked up from observation and local residents, it seems unlikely that any of these support salmon runs. The south side streams, however, drain out of the Kilbuck and Kuskokwim Mountains and are mostly clear water with good gravel bottoms.

The Eek is the first major stream encountered above the mouth of the Kuskokwim. It is a clear water stream above the juncture of the Middle and Main forks but becomes coffee colored below that point. This stream was surveyed from the head of the Middle Fork to just below the juncture of the forks on July 3rd. No fish were seen, and the general impression was that this was just a fair spawning tributary. It is purported to support salmon by Bethel residents.

The mouth of the Kvithluk River is approximately 114 miles upriver from the mouth of the Kuskokwim. The river itself is about 85 miles in length from its head in the Kilbuck mountains to its mouth in the tundra. This stream was surveyed by air on July 18 from a point 13 miles downstream from the head to a point 20 miles above the mouth. The stream is snow fed, and crystal

clear to a point 40 miles downriver from the head. Below there it starts to cloud due to erosion of several cutbanks and becomes quite muddy 20 miles above the mouth. As near as can be told, spawning gravel is excellent and cover seemed adequate at all points in the survey. No blocks were seen to fish migration. Kings and chums were counted during this survey. About 30% of the chums appeared to be spawning and 50%-60% of the kings. Not many carcasses were seen, and there were still goodly numbers of kings and chums being counted when the muddiness of the water near the mouth ended the survey. From those facts I assume that the stream was approaching peaking of the king run, but had not yet peaked. 1320 kings and 1300 chums were counted in the 52 miles surveyed. Kings were present at the head of the survey in fair numbers, but chums had only penetrated 55 miles upriver from the mouth. Probably this stream, if only two surveys could be made, should have been surveyed around July 23rd for kings and again around the 30th on chums.

The Kisaralik River empties into the Chukchlia about 130 miles above its mouth. It is approximately 90 miles long from its headwaters at Kisaralik Lake to its mouth. It appears to be a fairly stable clear water stream with adequate cover (ponds and cutbanks) and good spawning gravel all along its length, with the possible exception of the lower reaches in the 25 mile long canyon, the head of which is 15 miles below the lake. Here there are many bedrock extrusions and large boulder areas. Here also, are the only two possible blocks to fish migration. At a point 30 miles above the mouth, right at the canyon exit, there is a series of swift water chutes and rapids where the canyon constricts. 20 miles above this there are two small waterfalls. The lower falls have been examined on foot and look to be fairly passable. The chums may be a partial block, but kings, at least, pass through the canyon. On July 16th, 17th, and 18th, aerial surveys were flown on this river. Kings were seen as far up as 5 miles below the lake, and in the upper reaches of Quicksilver Creek, an upper tributary to the Kisaralik. Chums, however, had only made it

27 miles up from the mouth by the 18th. 1104 kings were counted and they were becoming fewer in number when very muddy water (again eroding cutbanks) caused the survey 13 miles above the mouth (we were flying downstream). 2300 carcasses were counted on this survey, and it seems unlikely that this run was any larger near peak on this date. On August 4th, through the main Kinsaralik was discolored by recent rains, one of the lower clear branches was surveyed by air. In 10 miles of river about 3200 carcasses and 1600 live chums were seen. This figure must be taken with a grain of salt as foul weather and poor water conditions mutilated the count. However, it seems probable that chums were peaking around August 1, and kings crested July 20th-25th. Arctic char and grayling were found in the river. Rainbow were reported, but observer saw none. No accurate identification of red salmon in the river has ever been made.

Kisaralik Lake was sampled by net and found to contain lake trout and Arctic char. No trace of red salmon found. The lake has at least 3 inlets that could support spawning. Surface temperature on July 16th @ 5:30PM 43° F. It may be feasible to establish a red run in this lake, however, a more careful assessment of potential spawning areas especially beach, is needed. The lake does not appear to be very productive.

Whitefish Lake south of Kalskag is a large, very shallow lake. For a distance of 300 feet off the inlet streams, Ophir Creek, depths varied from 1-3' and most of the lake seemed about the same from the air. The bottom is mostly sand. The inlet stream has a gravel bottom, but the gravel is somewhat comminuted by fines near the mouth. 6 whitefish were seen near the mouth of the inlet, (C. Clupeiformis). There are reports of Japanese prospectors having taken whitefish out of Ophir Creek many years ago. (Unsubstantiated).

The Aniak River empties into the Kuskokwim about 254 miles above the mouth of that river. The main Aniak runs from its headwaters at Dutch Lake some 35 miles to its mouth near the town of Aniak. Unlike the streams previously discussed, it has several main tributaries, the Buckstock River, Savpit Creek, Kipchuk River and Salmon River. All of these are major streams in themselves.

(the Salmon is about 35 miles in length) and support major salmon runs. This whole system is clear water with excellent spawning gravel and good cover. In this biologist's opinion it is probably the major spawning tributary of the Kuskokwim, although the contribution of upriver glacial tributaries is difficult to assess. Attempts were made to survey the Aniak by air several times this summer, but continual rains kept the river discolored a good deal of the time. On the 16th, 17th, and 18th of July, counts were made. These figures represent a fair count on kings, but low on chums since they showed up poorly in the dirty water. 1381 kings were counted from 5-10 miles below Aniak Lake (not seen) down to the mouth on July 18th. 35,900 chums were counted in this distance also. About 90% of the chums seen were spawning and 60-80% of the kings.

The Buckstock River contained some 151 kings, and 1410 chums on July 17th. Many chums were still schooled at the mouth. The Salmon River was surveyed for its full length on July 17th and 223 kings and 50 chums were counted in it. On July 16th, the whole Kipchuk was surveyed and 513 kings and 70 chums were counted. No carcasses were seen. Both the Salmon and Kipchuk were crystal clear. Kings were seen up the headwaters of both streams. In the observer's opinion this survey was too early and should have been delayed for one week to ten days - July 25-30th.

Silver salmon also run in the Aniak. No concrete evidence has been presented for the occurrence of red salmon in this system. Lake trout and grayling were turned up by netting in Aniak Lake. Dabbot and cottids were found in the outlet area of Aniak Lake. No trace of red salmon were found in Aniak Lake. The lake has two fair gravel tributaries but nothing is known of the beach spawning potential, and the lake does not appear to be very productive. Saw no fish from the air, and both tributary lakes had very low flow at their outlets.

On July 16th, the Holckuk was surveyed by air and 231 kings and 1030 chums were observed. No carcasses were seen. Kings had penetrated to within 10 miles

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of the headwaters and were widely scattered down to the mouth. Chums had only reached 20 miles upstream, and were followed in large numbers at the mouth. This stream was not near peak for either species, and the survey probably should have been made 7 to 10 days later. The Holokuk is some 40 miles in length. It is a clear water stream with apparently excellent spawning gravel from the head to the mouth. There appears to be a lack of pools and cover in some areas, but overall it was good. This stream is undoubtedly a major producer for its size. Looked at the lakes at the head of the Chinookuk, a Holokuk tributary on July 16th. No fish were seen.

Proceeding on upriver from the Aniak one runs into a series of small tributaries some of which may be major contributors to salmon production. However, the majority of these play a minor role. The first of these is the Owhat. This small stream a bog drainage, was surveyed on July 5th and 16th. On neither occasion were any fish carcasses, or the usually attendant stragglers noted. Next is the Kolmakof River. This is a slightly larger river than the Owhat, but still is a minor system. It was surveyed by air on July 5th and 16th, but was extremely muddy on the 5th and not any fish seen on the 16th. It is a bog drainage with coffee colored water. Victoria Creek comes next, but to date it has not been surveyed.

The Oskawalik River is about 40 miles in length. It has a gravel bottom, somewhat discolored water from bogs adjoining river, and overall fair cover. It has two main forks, with a small lake at the head of the main river. On July 16th no fish were seen from the air in this lake, and the outlet was found to be very small, probably presenting a block to fish migration. On July 16th an aerial survey was made of this river (not including the west fork) and 1790 chums and 48 kings were counted. Less than 10 carcasses were seen.

Kings had reached to within 5 miles of the headwaters, but most of the chums were below the juncture of the forks. This survey was obviously too early for peak spawning of the chums, but I am at a loss to explain the low count on kings. On July 22nd, the river was again examined by air, but was too muddy

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to survey. On August 2nd, the river was again too muddy to count, but respectable numbers of chums and kings were present and spawning.

The George River is a 55 mile stream with many forks and side streams. Much of the drainage is bog and the water is correspondingly dark making any type of assessment from the air difficult. On July 5th, the river was too muddy to survey. It was surveyed on July 16th by air and 463 kings and 200 chums were counted in the upper 40 miles of the main branch. In 20 miles of the east fork 63 kings and 180 chums were counted. The dark character of the bottom and the coffee colored water made counting on the lower part of each fork difficult to impossible, especially on chums. The king count was fairly good, but undoubtedly early in the run. Although kings were seen up to the headwaters of the main fork, very few carcasses were in evidence.

The Nolitna is a 120 mile long river. It has one main branch, the Nolitna. Superficial examinations were made of this stream by air, but no thorough survey has been made. For the most part it is a coffee colored bog drainage. No salmon have been seen in it, but local residents report it to be a good king stream. Whitefish lake at the head of the Nolitna branch is a ready, muddy affair and probably would not support rods.

The Stony River mouth is about 410 miles upriver from the mouth of the Kuskokwim. The main river length of this stream is some 155 miles, making it the largest tributary of the Kuskokwim. However, this is an extremely glacial system and its contribution to the runs in the Kuskokwim is difficult to assess. There is an Indian Village (Hungry) at Line Hills. These people fish in the Stony and take about  $\frac{1}{2}$  reds and  $\frac{1}{2}$  each of kings and chums. The total catch in 1959 was guesseed very roughly at 9,000 fish. Fishing is done by fishwheel. Tributary K9-2 of the Stony was surveyed by air on July 15th. This is a clearwater tributary. 920 chum carcasses and about 50 live fish were counted. Lake Telequana is on the Telequana River, an upper Stony River tributary. A 12 hour set in the lake produced red salmon, suckers, lake herring and lake trout on July 14th. Pike were taken in small side lake on rod and reel. This

is the only lake in the only system in the Kuskokwim that has been found to contain red salmon. It is probable that it, and perhaps Two Lakes at the head of the Necons River (another upper Stony tributary) support all of the red salmon run in the Kuskokwim. That the upriver tributaries do not support reds is graphically illustrated by the fact that fish camps at the mouth of the Stony were taking reds while those just a few miles upriver in the main Kuskokwim were not. The Telaquaana River has two sets of rapids and falls (not impassable) that might offer some possibility for fish enumeration as they climb the rapids. Aerial surveys on the Stony River will have to be confined to the lower clear water tributaries. The time to survey them would be early July, but a follow-up look see around July 20th would probably be valuable. It would seem unlikely that the peak chum run would be as early as indicated by last summer's surveys.

This year, for the first time, a comprehensive survey of the subsistence catch on the Kuskokwim was made. A two-man crew, Loren Foss and David Schub, traveled from McGrath downriver to Napakisk, a journey of some 465 miles in an 18' skiff. Catch per smokehouse was used as the index, since nearly every family uses a smokehouse for preserving fish and the total smokehouses in a village are easily counted, whereas separating families is often difficult. 76% or 229 out of 300 smokehouses existing between McGrath and Napakisk were checked. This gave an estimated 2132 people fishing. These people took an estimated 19,457 king salmon, 70,580 reds, and 266,487 chums. For analysis of catch the area surveyed was broken down into 50 mile divisions and people fishing and catch graphed for each area, (Figs. 1,2,3, & 4). This showed that the largest number of people fishing and the largest total catches of all species of salmon except chums came from the Bethel area, between Napakisk and Kwichuk. The largest total chum salmon catch was in the Aniak-Little Russian Mission area. Sheefish, smelts, whitefish, pike, pink salmon and silvers were utilized to a lesser degree.

This type of survey should be continued in future years to give an index of

relative run sizes. It also will reflect trends towards increase or decrease in the subsistence fishery. However, it should be done earlier in the year, around July 15th and the run should be made from the mouth up. This would answer several problems, better weather would be available, most of the fishermen would still be in camp, very few fish would have been used by that date, and the crew would be following behind the run peak, instead of intercepting it on the way down. All of the above were problems to some degree this summer.

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KUSKOKWIM RIVER

KOMMERCIAL FISHERIES DATA

1959 - 1960

Since commercial fishing has been in operation on the Kuskokwim River only since 1959, there is very little information available on the fisheries of this drainage, particularly of a comparative nature.

The only data available for the 1959 season is the number of king salmon caught per day and the total catch for the season. The total number of fishermen is also available, but it is impossible to accurately assess any unit of effort per day due to the extreme variation in fishing effort. Total number of man days has been calculated by using those catches as recorded by the Kuskokwim Packing Company of Bethel, which does not necessarily represent the actual daily fishing effort.

One other commercial operation was recorded for the 1959 season. This was H. Clark of Aniak. Both operators sold their fish fresh to Esmard Packing Company of Anchorage.

In 1959, Kuskokwim Packing Company received a total of 2,599 king salmon, representing 54 fishermen, 164 total man days and an average catch per man per day of 15.8 fish. H. Clark of Aniak caught a total of 1,161 king salmon in 20 man days for an average catch per day of 58.0 fish.

In 1960, more complete information was obtained by recording daily catch on the basis of fish ticket receipts. Again, this information is not completely reliable as many of these fish tickets were either incomplete or erroneously made out. The main difficulties were found in the failure of the commercial operator to record ADFG boat number, type of gear, and name of the fisherman. Another factor which became obvious as fish ticket receipts were examined, was that several fishermen were using the same boat to pick catches from their nets, thus making it nearly impossible

to assess a catch to a particular fisherman. These discrepancies were noted and an effort will be made to correct them next season by more explicit instructions and explanations to licensing agents, fishermen, and a closer watch on the commercial fishery, particularly on the pick-up boat operations or buyers who make out the fish ticket receipts.

The 1960 commercial catch data is divided into the three fishing districts of the river. Fifty-two percent (52%) of the total king salmon commercial catch was taken in the lower district, which conforms to the allowable quota percentage assigned to this area. The middle district catch made up approximately eighteen percent (18%) of the total catch, and the upper district thirty percent (30%). These two district percentages are not true representations due to fishing being conducted on both sides of a district boundary line. This is particularly the case in the Aniak area. The changing of this line for 1961 is designed to resolve this problem. Actually, the catches of the middle and upper districts are practically the same, and they were so designated in the regulations.

It is interesting to note the sixty-five percent (65%) increase in man days of fishing in 1960, compared to 1959. This is probably a valid indication of the increased interest in commercial fishing and indicative of the increase in fishing pressure anticipated on this river.

The silver salmon fishery was primarily in the Aniak area in 1960. This species probably represents a potential commercial fishery, since it is utilized little by subsistence fishermen due to the late run and the fact that present processing is dependent upon drying and smoking.

The Number II Table summarizes the 1959 and 1960 commercial fishing in the Kuskokwim River:

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YUKON RIVER

1960

Much general data has been written on Yukon River flows, drainage, climate, etc. Little of this will be repeated for this report. Suffice to say that the Yukon River is one of the largest rivers in North America, flowing some 2300 miles from its headwaters in British Columbia to its mouth in the Bering Sea. Further information on flows, gradient, climate, and additional data on fish runs, etc. may be taken from U.S. Fish and Wildlife River Basins Progress Reports I-V, U.S. Fish and Wildlife Annual Reports, and Gilbert and O'Malley's work on the fish of the Yukon in 1921.

In the main, other than work on the commercial fishery which will be presented later, a general survey was made of the drainage in 1960, including aerial surveys and interviews with residents and others. General stream surveys will be prosecuted first.

Pastelik River is the first "major" tributary to the Yukon. For most of its length it seems to be little more than a slough of the Yukon. There is some gravel in side tributaries and the upper reaches of this stream, but it is very limited. On July 7, a few fish which could have been salmon were seen from the air, but no positive identification could be made.

Mt. Village Stream (West Fork) was surveyed by air from head to mouth on July 7. Though small, the stream supports a fair run of salmon. On July 7, 7-10 kings and about 150 chum were seen in the stream. Not much spawning activity was observed. On July 23, 500 chum and about 200 carcasses were counted.

Mt. Village Stream (East Fork) is a very small and poor appearing stream with little gravel and very poor flow. No fish were seen on the July 7 aerial survey.

Andreeafski River is a large river (110 miles in main river length) and undoubtedly a good contributor to the salmon run. Gravel is available for all but the lower 15-20 miles and there are several fine looking side tributaries. This stream was surveyed twice by air this summer. On July 7, it was surveyed for its full length and 3,200 chums and 1,220 kings were counted. Most of the chums were schooled in the lower part of the river. About 50% of the kings appeared to be spawning and most were over 45 miles upriver from the mouth. On July 23, the visibility was poor, and the dark bottom of this stream made counts on chums especially poor. All the kings were schooled off the mouth of side streams. On the basis of experience gained since, I would say the stream was near peak. A rough estimate of carcasses present was 5,790; whereas, we only counted 220 live chums and 888 kings. However, carcasses are easily seen against a dark background, while spawning chums are nearly impossible to see.

Andreevski River (East Fork) is practically identical to the main river, but slightly smaller. It too was surveyed twice by air this summer. On July 7, 1,020 kings and 3,830 chums were counted; only about 20% spawning. They were still catching kings at the mouth of the river on this date. On July 23, 683 kings, 200 chums, and roughly 10,250 carcasses were counted. The count on chums was undoubtedly very low due to the dark bottom and poor visibility. Suggested survey for next year July 15 and July 23 again.

Chilkat River. Reznor has it that seals do not migrate upstream any farther than this river.

Anvik River, in my opinion, is one of the outstanding spawning tributaries of the Yukon. It is a clear water stream some 110 miles in length with excellent gravel for most of its length. Its tributaries, while small, are mostly clear water streams with gravel bottoms. On July 8, we made an

serial survey of the river. The fishery at the mouth near Anvik indicated that the run into this river was just getting under way. They had just started to catch what they called "Anvik Fish", kings and chums that were well watermarked, and apparently destined for some nearby stream. At the time of the survey, the lower river was obscured by murky water. Vast schools of chums were seen spawning in and moving through this area. Many redds were seen. Kings were scattered among the chums and were seen all the way to the headwaters. Many were spawning, but many were still entering the river with the large schools of chums seen below. In all, approximately 1,950 kings and 11,110 chums were counted in the main river. 550 kings and about 1,150 chums were counted in the three side tributaries surveyed. Very few carcasses were seen on this survey. The chums and kings in the murky area were hard to separate and impossible to obtain a total count on. The river was surveyed again on August 10, but was very muddy and counts were impossible. There were many gulls in the area. Dog salmon carcasses were plentiful and far outnumbered the live spawning chums. Many kings were seen spawning. 90 were counted in a 5 mile section above the Yellow River. For future reference, two surveys, one on July 12-15, (the most important one), and the other July 25-30, would probably bracket the major portion of the run. Grayling fishing in the Anvik is excellent. The river is navigable by river boat at least as far upstream as Beaver Creek.

Thirty-Mile Stream is one of a series of small streams and rivers feeding into the Yukon between the Anvik and Koyukuk Rivers. It is a small clear water stream averaging 15 to 30 feet in width with beaver dams, frequent log jams, and low water, presenting a possible blockage to salmon migration in the upper reaches. The gravel appeared excellent, clean, and rubble sized. Cover is fair to good. 1,350 chums were counted on July 9,

mostly near the mouth. Only about one-tenth of them were spawning. I would suggest a later date, say July 15, for future surveys with a follow-up survey 8 to 12 days later.

X-10, is another small, clear water stream with good gravel. It is, however, somewhat precipitous and contains some rapids and small falls that might present a block to fish migration. 200 chums were counted on July 9 off the mouth of the stream. The same survey dates for 1961 are suggested for this stream, for Thirty-Mile, Rodo River, and the Kaltag River.

On July 9, we also surveyed Split Creek, X-11a, both forks. The South Fork is a clear water stream with a gravel bottom as far down as the juncture with the North Fork. The North Fork is a murky stream with a muddy bottom. 1,360 chums were counted in the main river and the South Fork. Most were schooled near the mouth, and some were spawning. Only 20 chums were counted in the North Fork.

On July 9 the Rodo River was surveyed by air. It is a larger stream than the three previously mentioned. A somewhat murky-watered stream, it has a dark gravel bottom. Six kings and 3,460 chums were counted. Most of the chums were schooled near the mouth and about 1/3 were spawning. Only three carcasses were noted.

The Kaltag River was also surveyed by air on July 9. It is a crystal clear stream with a gravel bottom. Cover and flow both appear adequate. Surveying is difficult due to timber and brush overhanging this small stream. 690 chums and 10 (?) kings were counted. Most of the chums were schooled in the mouth, about one-quarter spawning.

The Mulete River was surveyed July 9 by air. Both the North and South Forks are clear water streams with gravel bottoms. This is a much larger system than those previously mentioned. No blocks to fish migration were

were noted. 30 kings and 1,470 chums were counted in the South Fork from its head to the mouth of the river and 56 kings and 1,260 chums in the North Fork. About one-half the chums seen were spawning. The kings were scattered thinly upstream. A subsistence Native with a net inside the stream mouth stated that it is not a good king salmon stream. They were catching whitefish and pike inside the stream mouth. On the 24th of July the river was again surveyed. Dark skies and inclement weather mixed up the counts, especially on chums. The river was apparently near its peak as spawners still outnumbered carcasses and there were many of both. On the 28th the river was again surveyed. Kings showed up well and 423 were counted in the South Fork of the North Fork. 273 were counted in the South Fork. The river seemed to be past its peak. Thousands of carcasses were seen, apparently outnumbering live fish. By August 13, the run was over; 24 kings and 15 chums counted in entire South Fork. I recommend a survey on July 15 and another on July 25 or 26.

The Koyukuk River remained something of a mystery. It is a large system with a great deal of gravel, and clean gravel too, but few fish. The main river was murky most of the summer, but cleared up around July 25. At that time 390 chums and 10 kings were seen in it. I was unable to ascertain whether any spawning occurs in the main river, but at this writing it appears doubtful. This river is subject to extreme flooding, and is said to have risen as much as five feet overnight. This, and the scouring action of the debris carried down with it, may account for the lack of fish in this system and the cleanliness of the gravel. I have listed in Table III the surveys made in this system and the results thereof. As can be seen, the results are very unimpressive. Apparently, from a pilot report, any chum surveys on the upper river should have been flown later in the summer.

However, Ernie Johnson, an oldtimer at Bettles, gave me the following information on kings. He said kings usually would be at Bettles by July 14 or 15 and chums shortly thereafter. The run lasts 3 or 4 weeks and salmon are caught up as far as Elyman. Both runs peak around July 30. He has seen kings in the Wild River, but thinks the Atlatna and the South Fork are the main producers. I think he knows of what he speaks, and if so, our surveys indicate that there isn't much of a king run in the river system. The first kings were caught at Hughes on July 1, however, they only take about 20 kings a year.

The run in streams upriver from the Koyukuk eluded us. I assume we were too early for them. Those below Fairbank were surveyed in general between July 11-13 and July 29-31. The only positive results were as follows: In Y 16<sub>1</sub>, a tributary to the Malozitna, 140 live chums were counted. This stream was not surveyed twice. Y 16<sub>2</sub> held 6 kings and 130 chums on July 11. Again, the survey was not repeated. Y 17<sub>b</sub>, just above the Nowitna, had 3 chums in it on July 11. On the 29th, only one carcass was visible. Illino's Creek on July 12 held no fish, but on July 29, two live kings were seen. On July 12, the Tazitna was barren of fish, but on July 29 in poor visibility, 106 kings, 13 carcasses, and 70 chums were counted. Totally unproductive looking streams were Big Creek and Nowitna system. The Malozitna and Yukon were not at all impressive.

In the Tanana drainage, timing of runs appears to be at odds with the other stretches of river an equal distance upstream. Table III also presents surveys and comments on Tanana drainage streams. As can be seen these streams seem to peak about the 31st of July. In 1961, they should be surveyed on July 29-31 and again around August 5-10. Other information

on the Tanana runs comes from the subsistence fishery in Nenana. One fisherman advised me that there was a good king run in the Tanana this year. He said the run lasted from three weeks to one month. Another source said the king run started July 1 in Nenana and ended around July 20. My fisherman informant, an apparently reliable source, says the chums start July 1, peak, slack off in early August, pick up again (called silvers due to brighter color than early fish--this is a common and probably valid statement that the later chums are brighter), in early September, and run until freezeup. On September 21, he was catching a few silvers, and about 400 chum per day in his wheel.

The Salcha River appears to be one of the main king spawning tributaries of the Yukon. Special attention should probably be given it next year as an indicator of the relative size of the king run.

Reliable sources state that silvers run in the Clearwater near Big Delta.

Above Rampart the streams were surveyed on July 29-30, with the exception of Beaver Creek and the Chandalar River which were surveyed on August 17 and 15 respectively. Streams as far up as Woodchopper Creek were surveyed. No significant numbers of salmon were counted in any of them. Later surveys by U.S. Fish and Wildlife Service showed kings in the Hodzana in August; chums in September; no salmon in the Madveenzie; chums in the Black River near the end of August; chums in the Sheenick in September; chums in the East Fork of the Chandalar, no date; chums and kings at Venetie in the Chandalar in August and early September.

Chums were said to be spawning in Forty-Mile River near Eagle Road on September 18. Kings are supposed to spawn in it also.

Information derived from Canadian sources pointed up certain spawning areas in Yukon Territory.

**Teslin River** supports many spawning kings from just above its mouth to Teslin Lake. Carcasses appear around August 20 but are thickest September 1-7. Chums spawn as far up as Swift Creek and are present October 6.

**Nisutlin River**, a tributary of Teslin Lake also supports king spawning, especially just below Nisutlin Lake.

The Takhini and McClintock Rivers, tributaries of the Lewes River, both support king spawning. These fish also migrate over the dam at Whitehorse-- 1066 in 1959 and 666 in 1960. These fish must be spawning in the Tagish-Atlin Lake systems.

Kings also spawn in:

Big Salmon River, especially below Big Salmon Lake where peaking occurs around August 10. Little Salmon River spawning occurring around August 20. Tatchun River below Tatchun Lake, tributary to main Yukon. McQuestern River, tributary to the Stewart River. Spawning below Vancouver Creek at least.

South and North Forks of the Klondike River near Dawson City. Kluane River below Kluane Lake and up first main tributary below Kluane Lake. Spawning from mouth up to unnamed lake. Kings peaked at Dawson City on July 29; chums on September 8.

## COMMERCIAL FISHING

It was considered wisest to leave the fisheries in this area on the same quota basis that had been in effect since 1954, at least until an adequate number of personnel were available for management, and until our staff had an opportunity to experience a season's run. The quotas restricted commercial fishing to king salmon only, preserving the other species exclusively for the subsistence fishery.

On the Yukon, the lower sub-district from the mouth of the Yukon upstream to the mouth of the Anuk River, was closed on June 21 after reaching its quota, 50,000 king salmon. The middle sub-district from the mouth of the Anuk River upstream to the mouth of the Bonasila River, was closed on June 25 after passing its quota of 10,000 king salmon. The upper sub-district, from the mouth of the Bonasila River upstream to the Canadian Border, never reached its 5,000 fish quota.

Table IV gives the commercial operators on the Yukon in 1960 and their type of operation. Table V gives the catch by sub-area, by day, all gear mixed. It also gives average catch/man/day and cumulative and total catch. Table VI gives the catch by gear by day by man for the middle district. The lower district fished only set nets and the upper only fishwheels.

The run this year was not exceptionally large. The major peak in the run was not so pronounced as in 1959, nor was the catch per man per day as high as it has been in other years at any one point in the season. The peak seems to be more sustained than in many years. Still, the catch reaching the quota in the lower district by June 21 seems to be a function of increased effort rather than an increase in the size of the run over previous years. Fish and Wildlife Service reports for 1958 and 1959 showed the following comparative figures:

AVERAGE NUMBER OF  
FISHERMAN/DAY FOR SEASON

	LOWER DISTRICT	MIDDLE DISTRICT
1958	73.0	51.3
1959	93.5	65.5
1960	96.7	62.4

There is also a general trend towards an increase in the number of fathoms of gear fished by each fisherman. Fish and Wildlife figures for 1958 and 1959 show:

TOTAL FATHOMS OF GEAR FISHED

	LOWER DISTRICT	MIDDLE DISTRICT
1958	8,425	7,000
1959	11,795	8,050
1960	21,850	5,925

It should be noted that our 1960 statistics were taken directly off the license applications and are probably an exaggerated representation of the number of fathoms fished, since very few of the fishermen in the area actually fish the number of fathoms for which they are licensed. I have been unable to determine how Fish and Wildlife Service figures were reached, and the same thing may hold true for them. However, there has been a definite increase in gear, at least in the lower sub-area. The only way to eliminate this bias will be to require operators to provide the Department with the actual number of fathoms fished each year by their fishermen.

Figures 5, 6, and 7 present the comparative catch/fisherman/day for the lower sub-area in 1959 and 1960, and the catch/fisherman/day for the

middle sub-area in 1960.

Escapements upriver appeared adequate and the only complaints of poor fishing in the subsistence fishery were admittedly due to poor fishing conditions--high water, drift, etc. It is extremely difficult to compare past spawning ground surveys with this year as this observer was not present on surveys prior to 1960 and many of the surveys were done at under peak run conditions.

The same difficulties with incompletely filled out fish tickets, more than one fisherman using the same boat to pick their nets, etc., that were noted on the Kuskokwim were encountered on the Yukon to a lesser degree. We will attempt to correct this next year by better dissemination of instructions on filling out tickets.

**SUBSISTENCE FISHING - YUKON RIVER**

No detailed surveys were made on the Yukon subsistence fishery in 1960. However Ron Rogerson, Fisheries Officer, Yukon Territory, surveyed the subsistence fishery in the Upper Yukon drainage. His findings are presented below.

Dawson City commercial catch from five fishwheels:

Kings 61,584 lbs.  
Chums 29,310 lbs.

Subsistence fisheries:

<u>Area</u>	<u>Kings</u>	<u>Chums</u>
Dawson City	480 lbs.	625 lbs.
Ross River	7,500	
Teslin River	12,675	
Minto	3,150	7,950
Pelly River	3,100	
Carmacks	27,000	12,000
Old Crow		12,600
<b>Total Subsistence</b>	<b>53,905</b>	<b>33,175</b>
<b>TOTALS-ALL FISHING</b>	<b>115,489 lbs.</b>	<b>62,485 lbs.</b>

COASTAL

Aerial surveys north of the Yukon were initiated this year. Actually, only the fringes were touched, but they pointed up the direction for the 1961 season. Each river will be taken in turn starting with the Goodnews and working north. Table VII gives the results of aerial surveys on the coast.

The Goodnews River is an excellent large stream originating in Goodnews Lake in the Ackhlun Mountains and flowing into the Bering Sea through Goodnews Bay. It is a clear water stream with excellent spawning gravel from its mouth up to the lake. The stream contains all five species of Pacific salmon, rainbow and dolly varden trout, and at least one species of whitefish.

The Goodnews was surveyed by air on July 20. (See Table VII). At that time, the run was apparently at peak for kings and chums. Many carcasses were seen, and 90% of the chums and about 80% of the kings counted were spawning. In addition, there were about as many already deserted redds as fish counted. Grayling and smelt are probably present also, but have not been seen by this biologist. Goodnews Lake and Canyon Lake support runs of red salmon. On July 20, 3,400 reds were seen in Goodnews Lake, 300 were in the outlet, 2,000 in or near the inlet stream, and about 1,100 scattered around the lake. Very little beach spawning was evident. The town of Goodnews is

situated at the mouth of the river. The residents of this town fish in the river for subsistence purposes, but no survey has been done of the number of fish involved in this fishery.

A report on the Kanektok appears elsewhere in this publication. Most of the streams from that point north to the Seward Peninsula, not including the Yukon and Kuskokwim, received such a cursory examination that nothing more will be said about them here except that those in Norton Bay probably offer commercial possibilities and will bear further examination in 1961.

The Unalakleet River was looked over on August 10. The chum run was just about over. General consensus in this area and farther up the coast is that king salmon are on the increase every year.

The Nuukluk and Fish River system flowing into Golovin Bay on the Seward Peninsula appears to be well worth further investigation. We landed at White Mountain on August 13. We were told that the pinks and chums start entering the river on June 14. The pinks peak in late June and early July. Silvers were just starting to come in, and we were told they would be running heavily in five days time. The people at White Mountain carry on a subsistence fishery. They take pike, grayling, trout and whitefish from May to October 13 (freeze up approximately). There is a big herring run in Golovin Lagoon in May and June and August through October.

There is a herring run of same size into Safety Lagoon outside of Nome.

The Solomon River was surveyed on August 11 by air. One chum carcass (checked on foot), four or five pink carcasses, and 220 spawning pinks were seen. However, no fish were seen above the air-strip, site of the main dredge workings. The flow in this stream is extremely erratic, volatile in places, and a trickle in others, presumably due to loss through loose dredge worked gravel. This stream has really been worked over by dredges. On foot, I saw two grayling 13-18 inches in length. There were 5 or 6 subsistence fish camps on the lagoon at the mouth of the river. One camp had about 300 dried fish on the racks, of which about 90% were pinks and 10% char.

The Nome River is another dredge modified stream. On August 11, I checked the catch of a subsistence fishermen in Nome Lagoon. He had taken 4 chums, 2 pinks, 1 silver, 6 Arctic char, and 4 starry flounder. I was told that the silvers usually start on July 25, but this year they were just starting on August 10.

The Teller area was visited twice this year. On June 10, the ice had only been out of Grantley Harbor one week. Subsistence fishermen were taking whitefish and starry flounder locally. They say the main whitefish runs are out into salt water in the spring and back into fresh water in the fall. Most subsistence fishing is done in Tuksuk Channel. I was told that reds start running around June 10 and peak around July 1. Chums apparently predominate in this system. A general evaluation of this drainage is: Main Kuzitrin above Belt Creek, poor with a grassy lava bottom and blocked in places by lava

dikes; Noxapaga River, much the same; Kuskukuk Creek, a fair looking stream, however, much past mining activity and one dredge still active on it; Main Kuzitrin below Holt Creek appears to have some potential. Salmon Lake, at the head of the Pilgrim River, supports red salmon. On August 13, we saw 130 beach spawners and 90 geds in Grand Central River, a tributary to the lake. Large offal piles were visible in the lake around the camps of subsistence fishermen who apparently came up from Nome to fish in the lake. Seven or eight nets were in the water and five or six fish camps were in operation. Overall, the system might support a very limited commercial fishery.

RECOMMENDATIONS

Kanetok River: It is recommended that in 1961 commercial fishing on this river be opened to all species of salmon on a time basis. Chum salmon predominate in this stream and fishing on a large quota basis on reds and a smaller quota on other species leads to considerable wastage of fish. Since this is a clear water system and fishing is restricted to within the mouth, it should be fairly easy to manage by field announcement.

An accurate count should be made on at least the red salmon entering this river. This could be accomplished by the establishment of a counting tower at the outlet of Lake Kagati. It would be desirable to obtain a total count of all species entering the river, but an attempt to locate a tower farther downriver is apt to encounter the same difficulties experienced this year.

Kuskokwim River: It is recommended that the commercial fishing in the lower district of this river be regulated on a time basis rather than the present quota system. An increased interest is being shown in commercial fishing in this area and an increased pressure will probably be the result. On the quota system, without a schedule of closures, fishing occurs on a very limited portion of the run. The potential is present of damaging one particular stock or race and allowing over-escapements of other stocks. With a flexible system of openings and closures this danger can be minimized. Spreading the fishing effort out over the whole run would also present the Department with valuable information as to timing of peaks within the run that cannot be gained from a quota fishery. Commercial fishing should be allowed on king salmon only prior to August 1 to assure adequate upstream escapements of red and chum salmon to the subsistence fishery. The quotas now in effect upstream should be maintained.

A tagging program should be initiated on this system. Since the Kuskokwim and many of its tributaries are extremely silty, tagging is the only method by which we will be able to evaluate the contribution of various parts of the run at the mouth to the subsistence fishing upriver. It is also the only way we will be able to assess the relative importance of various spawning tributaries to the fishing in this system. With a buildup of equipment over the years we may be able to attempt a population estimation through tagging at some future date. Fishwheels should probably be used in tagging and test fishing should be carried on concurrently with nets to test the efficiency of the wheels.

The subsistence survey and aerial surveys of key tributaries should be continued.

Yukon River: The lower two districts of the Yukon should be placed on a flexible system of management for the same reasons as those for the Kuskokwim. Similarly commercial fishing should be restricted to king salmon only prior to August 1. Subsistence fishing should be restricted to the open periods of the commercial fishery due to the great participation in this commercial fishery and the difficulty of enforcing a closure if nets are allowed to remain in the water. The closure for 48 hours prior to the opening and following the closure of commercial fishing on king salmon should be reinstated also for enforcement reasons. Though not mentioned above, these last two recommendations hold true for the Kuskokwim as well. The upriver quota should be held at 5,000 kings and 5,000 silvers, but the dividing line between the upper and middle districts should be shifted downstream to Marshall. There is no intensive commercial fishing above this point and shifting the line will allow people above Marshall to fish seven days per week for subsistence purposes.

A tagging program should also be initiated on the Yukon for the same reasons as on the Kuskokwim. Test fishing should also be tried.

An extensive subsistence fishing survey should be started on the Yukon next year and aerial surveys of key tributaries should be repeated.

Coastal North of the Yukon: Interest is being shown by many people in commercial fishing north of the Yukon. This area should be opened to commercial fishing for salmon. As most of the streams are clear and well separated from each other, management on a flexible basis system by system should not be difficult.

Stream surveys in this area should be continued and expanded.

General: No commercial licensing should be required for the fishing for and subsequent sale of dried fish for dog feed. This is a basic economy in many villages and the cost of commercial licenses is prohibitive to this practice.

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1960

ANNUAL REPORT

ARCTIC-YUKON-FUSKOKWIM AREA

CHARTS

APPENDIX FOR CHARTS

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Table I

KANEMAKEE RIVER  
DAILY COMMERCIAL CATCH

1960

DATE	RED SALMON			SILVER SALMON		
	Number Fished	Number Fishermen	Catch lbs/day	Number Fished	Number Fishermen	Catch lbs/day
<b>JULY</b>						
8	42	1	42.0			
9	166	3	55.3			
11	386	3	128.7			
12	576	6	96.0			
13	281	5	56.2			
14	274	5	54.8			
15	306	5	61.2			
16	210	3	70.0			
18	292	6	48.6			
19	192	7	27.4			
20	373	7	53.3			
21	239	6	39.8			
22	715	10	71.5			
23	75	1	75.0			
25	318	4	79.5			
26	168	4	42.0			
27	181	3	60.3			
28	135	2	92.5			
29	90	2	45.0			
30	153	5	30.6			
<b>AUGUST</b>						
1	243	5	48.6			
2	32	2	16.0			
3	60	5	12.0			
4	31	5	6.2			
5	20	4	5.0			
8	16	3	5.3			
9	6	2	3.0			
10	3	3	1.0			
11	1	2	.5			
12	2	2	1.0			
13	3	2	1.5			
15	2	2	1.0			
16	3	2	1.3			
17	4	2	2.0			
18	1	2	.5			
19	0	4	.0			
20	0	1	.0			
TOTALS	5,649	136 men/fifys		3,060	30 men days	
Avg/Catch/ Man/day			41.7			78.9

## TABLE II

## COMMERCIAL CATCH - KUSKOKWIM - 1959-1960

	Total Fish All Gear	Total Fish Set Net	Total man days Set Net	Total Fish Drift Net	Total man days Drift Net	Catch/man per day Set Net	Catch/man per day Drift Net	Catch/man per day All Gear
<u>KING SALMON - 1960:</u>								
Lower District	2,927	1,635	154	1,292	60	11.0	21.3	13.1
Middle District	1,231	366	6	865	34	61.0	25.2	30.3
Upper District	1,311	18	2	1,793	23	9.0	71.2	67.2
TOTALS:	5,969	2,019	162	3,950	119	12.8	35.2	21.7

SILVER SALMON - 1960:

2,498			2,498	27		92.1	92.1
-------	--	--	-------	----	--	------	------

KING SALMON - 1959:

Kuskokwim Packing Co. (Bethel)	2,599				Total man days-164			15.1
Harry Clark - Aniak	1,161				Total man days- 20			56.1

Total Commercial King Catch -1960..... 5,959  
 Total Subsistence King Catch -1960..... 10,457  
 Total Commercial Silver Catch-1960..... 2,498  
 Total Subsistence Silver Catch -1960..... 106,407  
 Total Subsistence King Catch -1960..... 70,579

TOTAL COMM. ALL SPECIES - 1960..... 133,464

TABLE III

RIVER	DATE	KINGS	CHUMS	COMMENTS
Alatna	7/25	4	40	Muddy water throughout rest of summer. No fish counted in Halibutjack or Rocky-bottom Creek, but they are rumored to support kings.
Malemute Fork	7/25	17	10	
Mettenberg Creek	7/25	None seen		
Sozhekia River	8/14	X (?)		Poor weather, poor survey, looked like kings
South Fork	7/11 & 28; 8/15	1 king seen 7/28		Pilot reports some carcasses in river in September.
Jim River	7/11	X	X	Few fish as yet
John River	7/15	None seen		
Malemute Fork	8/15	Two carcasses		
Eala Creek	7/11	None seen		
	7/23	7		No carcasses, no chums
Wild River		Contains kings, but very few seen		
Gisass	7/10	42	180	No carcasses, no fish at mouth, as though spawned out.
	7/24	300	400	Appears spawned out again; no fish at mouth, many carcasses this time.
Kateel	7/10	3 carcasses	6 carcasses-No fish near mouth, old bear tracks all over bars--spawed out??	

TABLE III

RIVER	DATE	KINGS	CHUMS	COMMENTS
Dakli River	8/13	None seen		
Wheeler Creek	8/13	None seen		
Nogatza River	7/19	None seen in main river		Mud bottom and coffee colored water.
Caribou Creek	7/19		170 live	Not spawning yet
Clear Creek	7/10		210 live	Not spawning yet
Klikhentekna Cr. Y14-10 Y14-11				All coffee-colored bog drainages with little or no gravel and the same number of fish.
Indians River	7/11		11 live	Water very dark.
	7/23		500 carcasses - Near peak; all fish seen were spawning. 1620 alive	
Chitina River	8/17	4 live		
Chena River	7/31	3 dead, 132 live		
	8/17	8 live		
Little Chena	8/17	None seen		
Salcha River	7/30	100 dead 1560 live	70 live	A good survey.
	8/18	15 live	600 dead 170 live	Apparently way past peak. A good survey.
Goodpaster	7/31 8/18	126 live	26 dead, 13 live	Poor survey due to muddy water. Clear water; good survey.

*Table IV*

1960 COMMERCIAL OPERATORS  
ARCTIC-YUKON-KUSKOKWIM AREA

YUKON RIVER

LOWER DISTRICT (Mouth to Anuk River):

<u>COMPANY</u>	<u>LOCATION</u>	<u>OPERATION</u>
Amukon Trading Company	Black River	Saltery
Alestrom Trading Company	Black River	Hard Salt & Mild Cure
Yukon River Fishermen's Cooperative Association	Alakanuk	One line cannery
Northern Commercial Company	Sheldon's Point	Hard Salt & Mild Cure
" " "	Kwiguk	Cannery
Yukon King Company	Kwiguk River mouth	Mild Cure & Hard Salt
" " "	Middle Mouth	Mild Cure & Hard Salt
Yukon Fishing & Transportation Incorporated	Middle Mouth, 20 miles from Hamilton	Saltery

MIDDLE DISTRICT (Anuk River to Bonasila River):

Mountain Village Fish Company	Mt. Village	Saltery
Henry Bogler	Pitkas Point	Cannery
Yukon Packers	St. Mary's Mission	Cannery
Beckman Enterprises	Pilot Station	Saltery
Glyde Francis	Pilot Station	Saltery

UPPER DISTRICT (Bonasila River to Canadian Border):

Weisner Trading Company	Rampart	Cannery
Northern Commercial Company	Fort Yukon	Fresh Frozen Fish

KUSKOKWIM RIVER

KANEKTOK RIVER:

Quinhagak Salters	Quinhagak	Saltery
-------------------	-----------	---------

LOWER KUSKOKWIM (Mouth to town of Akiachak):

Arctic Alaska Fisheries	Bethel	Fresh fish to Anchorage
Kuskokwim Packing Company	Bethel	Fresh fish to Anchorage

UPPER KUSKOKWIM (Akiachak to headwaters):

Clark Enterprises	Aniak	Fresh fish
-------------------	-------	------------

TABLE V

## Yukon River CATCH STATISTICS

JUNE 1960

SUB-AREA	DAY	NO/FISHERMEN	CATCH KGS.	CATCH/H		CATCH/MAN/H	CATCH/H
				TIME	EXPERIMENT		
		334-10	LONG R	1357 KGS	Catch/Hour		
10	1 24	8	13	1.6	.07	1.6	
	2 24	23	46	2.1	.09	2.1	
	3 24	429	106	3.6	.16	3.6	
	4 19	425	86	3.4	.19	3.4	
	6 18	34	194	5.7	.32	5.7	
	7 24	57	539	9.5	.39	9.5	
	8 24	89	811	9.1	.38	9.1	1,727
	9 24	106	2,454	23.2	.97	23.2	4,231
	10 24	119	2,479	21.0	.87	21.0	6,210
	11 18	141	3,033	21.5	1.19	21.5	9,733
	12	1	6				
	13 16	134	2,856	21.4	1.19	21.4	12,670
	14 24	147	6,283	43.4	1.81	43.4	19,114
	15 24	153	7,097	46.4	1.93	46.4	26,313
	16 24	151	8,180	53.3	2.22	53.3	34,912
	17 24	138	6,843	49.6	2.07	49.6	41,634
	18 18	134	3,015	22.5	1.25	22.5	46,069
	19						
	20 18	125	3,925	31.4	1.74	31.4	47,934
	21 8	129	3,719	21.1	2.64	21.1	50,733
			30,713				

20	3	24	Hours	3	MIDDLE RIVER		Catch/Hour
					1.5	.06	
	4	18	11	16	1.5	.08	1.5
	5	18	7	24	2.0	.11	2.0
	6	24	18	120	7.1	.30	7.1
	7	24	42	134	3.2	.13	3.2
	8	24	37	103	2.9	.12	2.9
	9	24	66	333	5.0	.21	5.0
	10	24	62	389	6.3	.35	6.3
	11	15	62	457	7.1	.39	7.1
	12	18	64	571	6.6	.28	6.6
	13	24	86	345	6.6	.19	6.6
	14	24	75	284	3.9	.16	3.9
	15	24	72	326	4.1	.18	4.1
	16	24	75	268	3.5	.19	3.5
	17	24	75	688	9.0	.54	9.0
	18	15	70	953	12.1	.50	12.1
	19	24	79	1,020	11.2	.47	11.2
	20	24	91	1,975	19.9	.83	19.9
	21	24	99	4,557	44.2	1.84	44.2
	22	24	103	3,414	30.3	1.68	30.3
	23	18		15,954			

TABLE V  
CATCH STATISTICS

June 1966

SUB-AREA	DAY	No. FISHERMEN	CATCH KINGS	CATCH FISHERMEN	CUMULATIVE CATCH
<u>UPPER DISTRICT</u>					
30	21	1	2	2.0	2
	24	1	6	6.0	8
	25	1	11	11.0	19
	26	1	13	13.0	32
	27	2	22	11.0	33
	28	2	35	18.0	51
	29	2	24	12.0	114
	30	2	51	25.5	165
1	1	12	12.0	177	
2	2	44	14.7	221	
3	3	40	13.3	261	
4	3	52	17.3	313	
5	2	63	31.5	376	
6	1	82	82.0	458	
7	3	85	28.3	543	
8	2	78	39.0	611	
9	2	33	16.5	654	
10	2	36	18.0	690	
11	2	79	35.0	760	
12	2	68	30.0	820	
13	3	64	21.3	834	
		334			

TABLE VI

MIDDLE SUB-DISTRICT  
BY GEAR

SUB-AREA	DAY	GEAR	NO. / FISHERMAN	KINGS	FISHING RATE
<u>SET NET</u>					
20	3	Set Net	2	3	1.5
	4		11	16	1.5
	6		7	14	2.0
	7		16	125	7.8
	8		38	122	3.2
	9		33	97	2.9
	10		51	258	5.1
	11		48	302	6.3
	13		46	308	6.7
	14		60	433	7.2
	15		58	293	5.1
	16		56	232	4.1
	17		53	235	4.4
	18		59	201	3.4
	20		43	347	8.1
	21		52	631	12.1
	22		64	761	11.9
	23		58	1,188	20.5
	24		63	2,786	44.2
	25		76	2,178	28.7
				<u>10,535</u>	
<u>DRIFT NET</u>					
20	7	Drift Net	2	3	1.5
	8		4	12	3.0
	9		4	9	2.3
	10		15	75	5.0
	11		14	87	6.2
	13		18	149	8.3
	14		26	138	5.3
	15		17	50	2.9
	16		16	52	3.3
	17		22	91	4.1
	18		17	67	3.9
	20		27	341	12.6
	21		27	322	11.9
	22		27	259	9.6
	23		41	787	19.2
	24		40	1,771	44.3
	25		37	<u>1,246</u>	33.7
				<u>5,459</u>	

TABLE VII  
AERIAL SURVEYS OF COASTAL STREAMS  
1960

RIVER	DATE	KINGS	CHUMS	PINKS	REDS	COMMENTS
Goodnews	7/3	60	640	--	980	
	7/20	2,503	8,500	--	300	At or just past peak.
Goodnews Lake	7/3				400	No spawning yet.
	7/20				3,400	Little beach spawning, mostly in inlet.
Middle Fork Goodnews	7/3				200 (?)	
Cripple Creek	7/3		X			
Arolik	7/3	No fish seen				
East Fork Arolik	7/3	A few kings				
South Fork Arolik	7/3	No fish seen				
Egavik Creek	8/10	No counts made, but many spawning fish present				
Shaktoolik River	8/10	No counts made, but many spawning fish present				
Tingalik River	8/10	No counts made, but many spawning fish present				
Solomon River	8/11		1 carcass	4-5 carcasses		
				220 spawners		
Yome River	8/13	2	410			Some may have been chums; poor visibility.
Niukluk River	8/11	1	150			Some may have been chums.

TABLE VII  
AERIAL SURVEYS OF COASTAL STREAMS

RIVER	DATE	KINGS	CHUMS	PINKS	REDS	COMMENTS
Kuzitrin River	8/11			710		Probably pinks; about 90% spawning.
Belt Creek	8/11	No fish seen				
Kougarok River	8/11			15		

# FIGURE 1

ESTIMATED TOTAL FISHING PEOPLE  
2,132

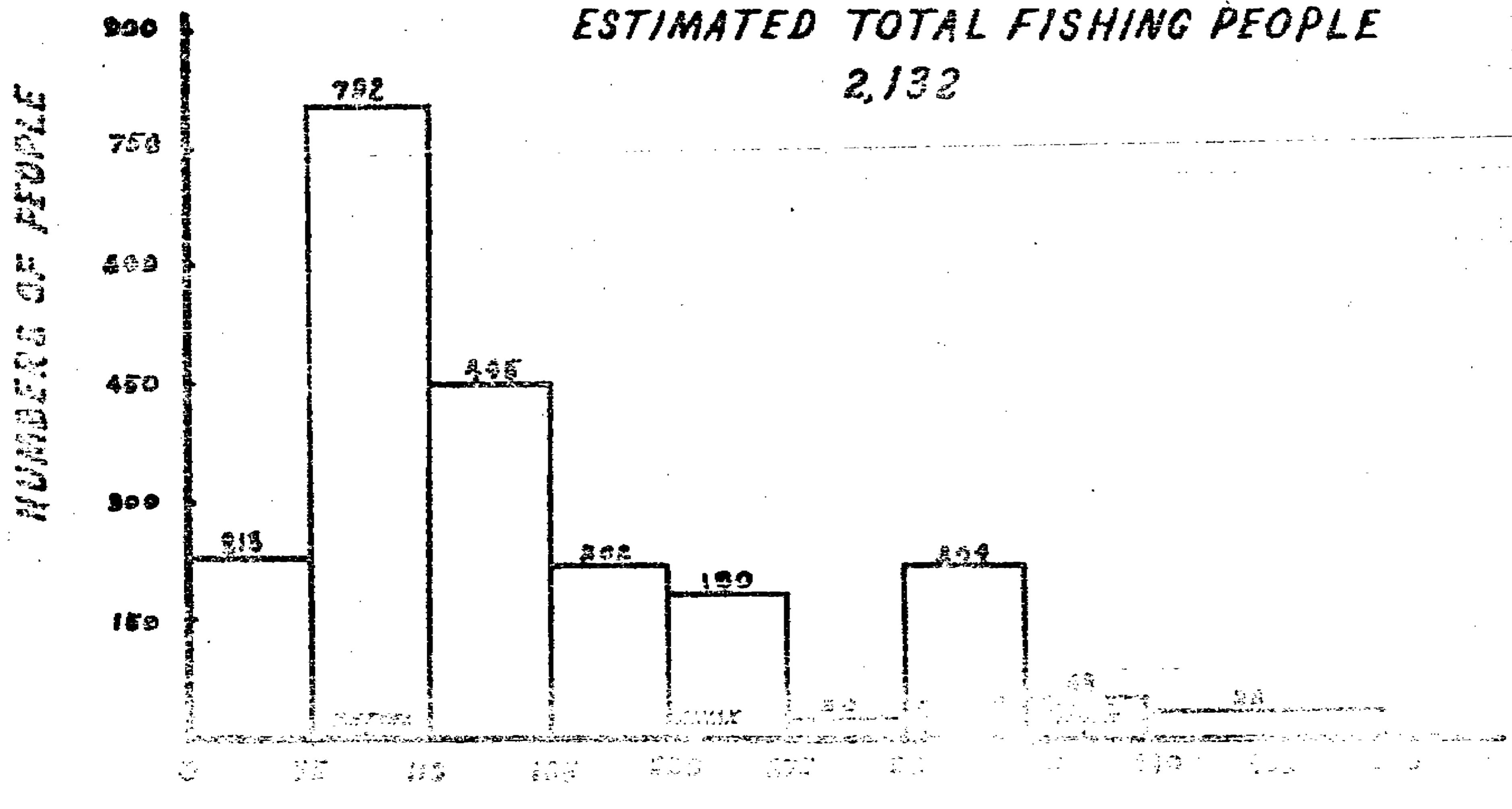


FIGURE 2

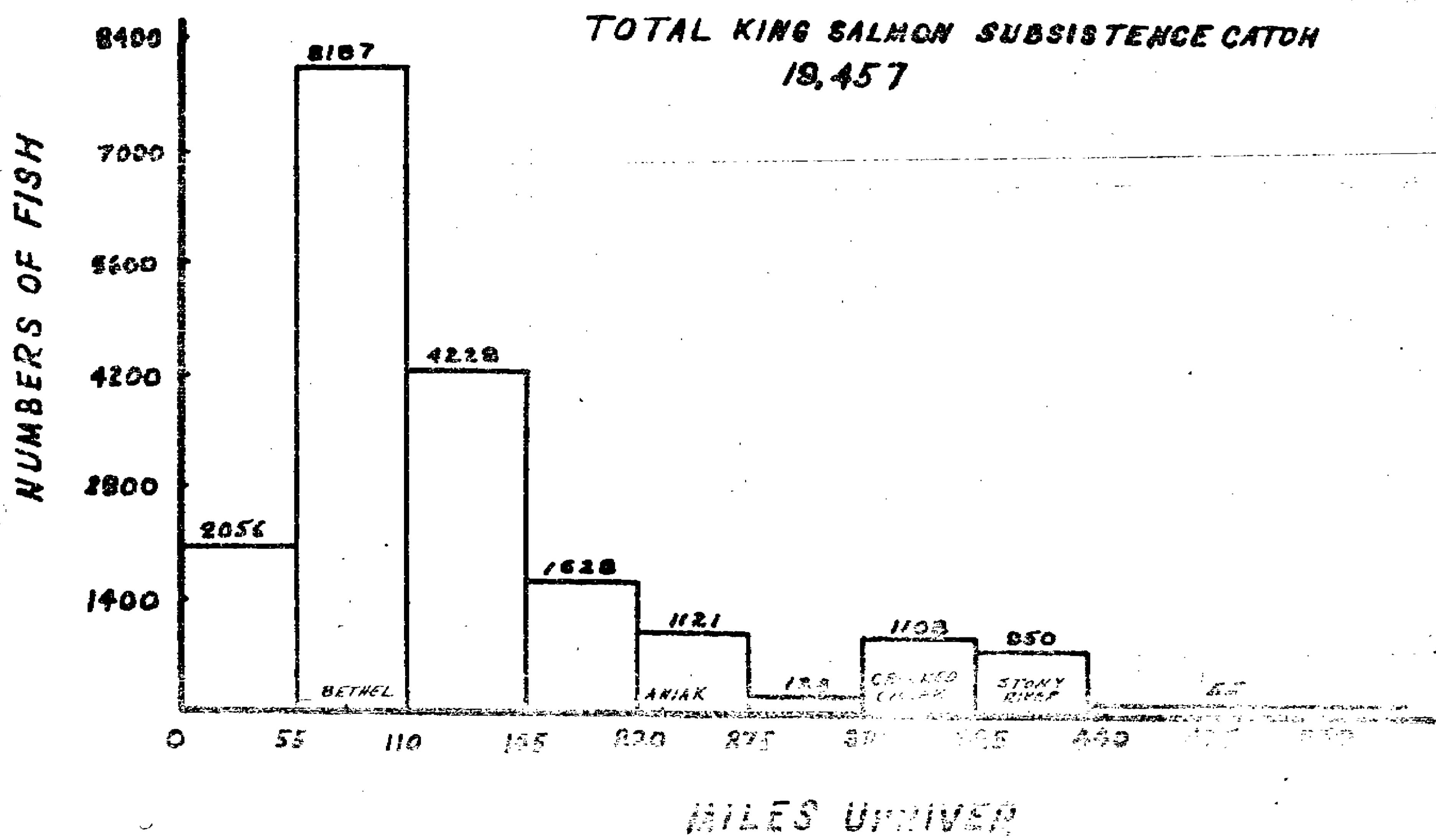


FIGURE 3

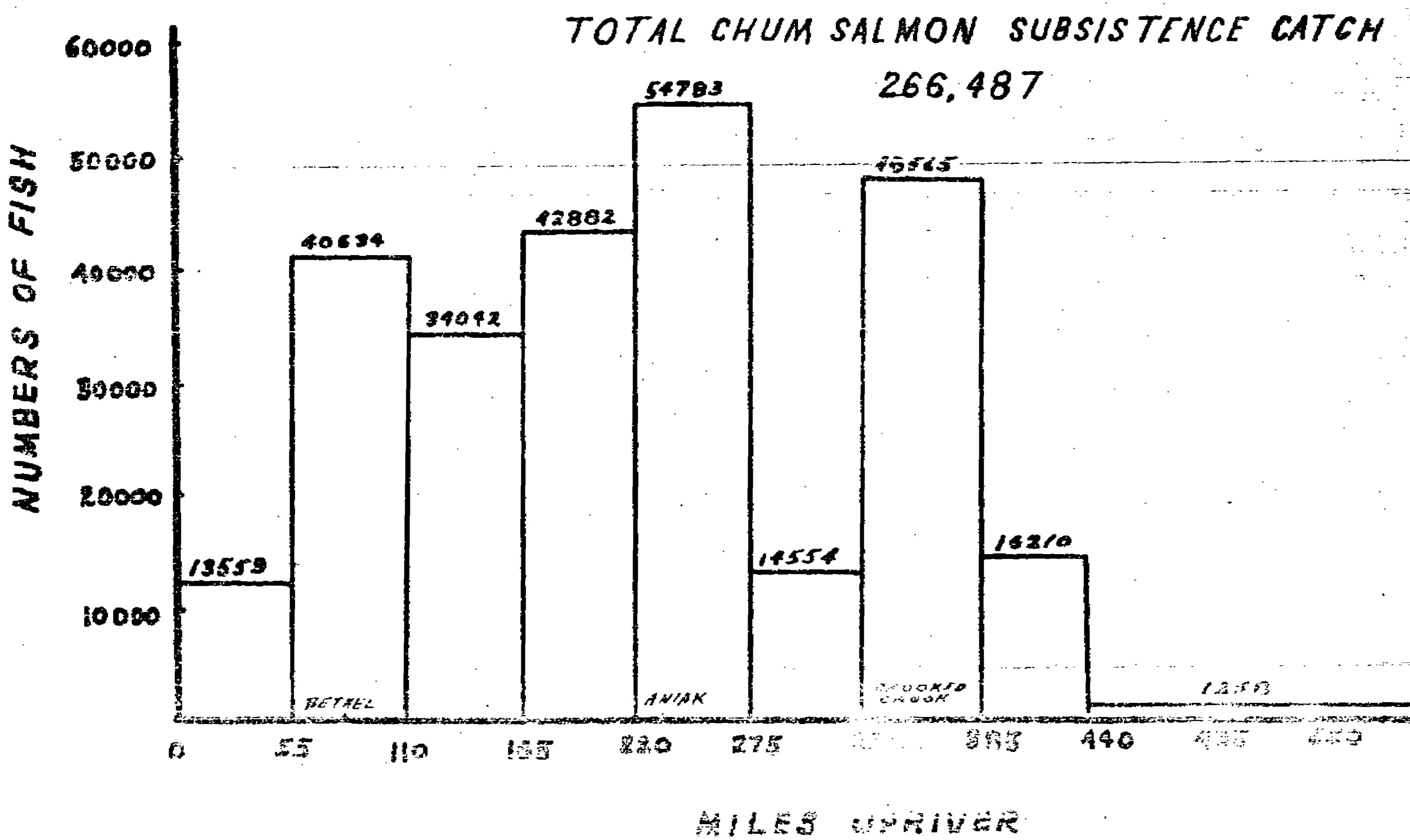
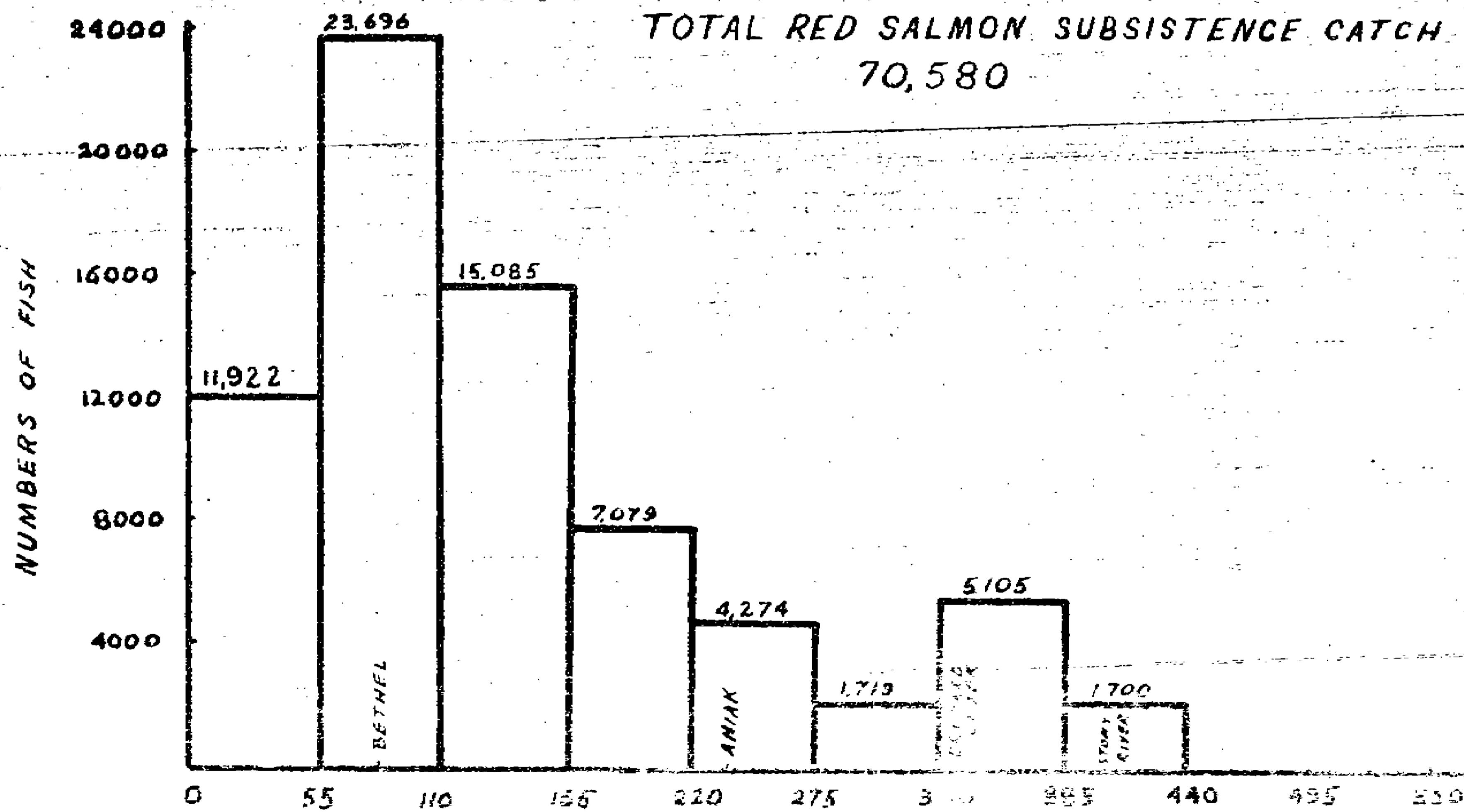


FIGURE 4



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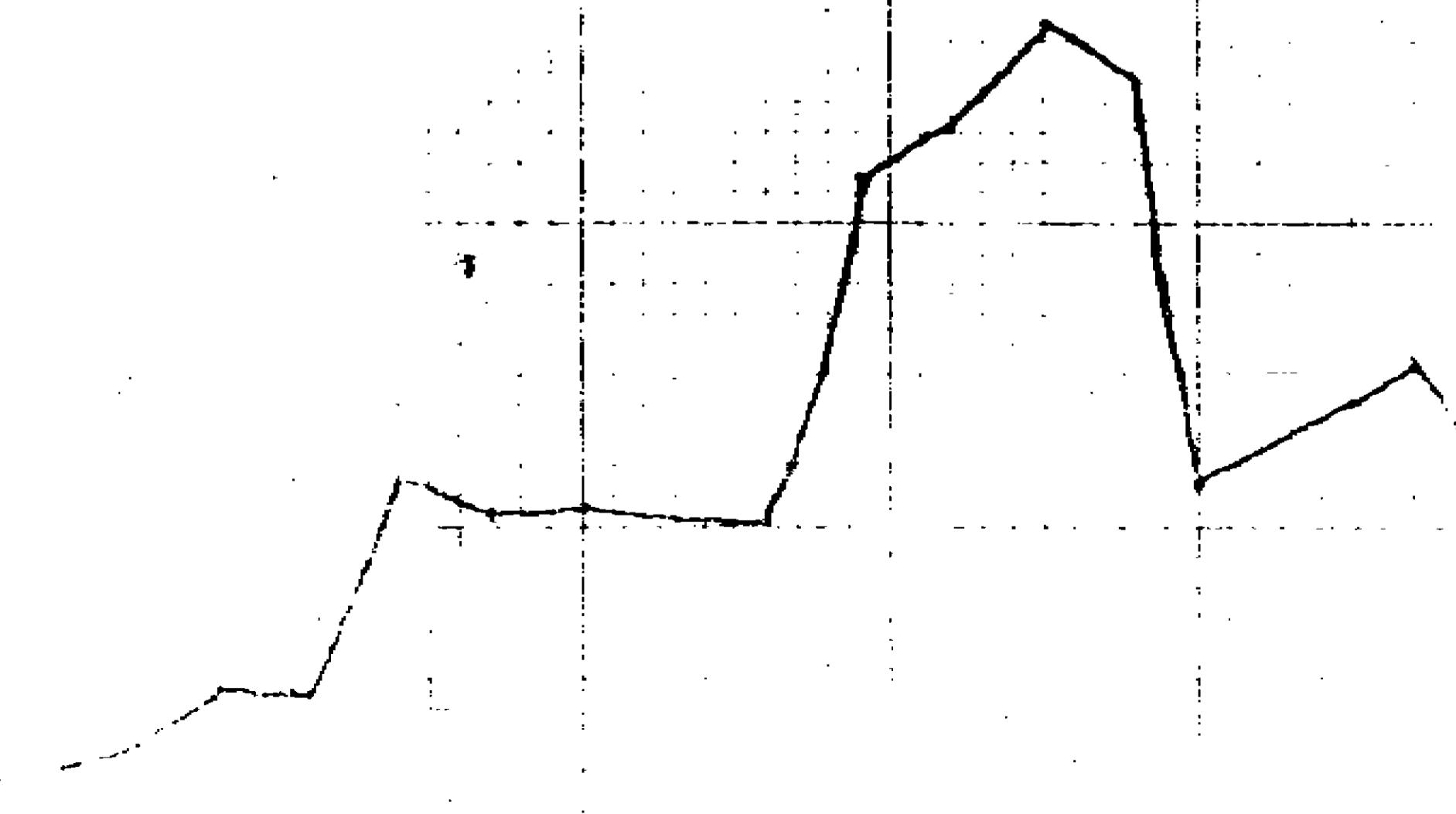
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King Salmon  
Catch / Man / Day  
Lower - Yukon District  
1960

Catch / Man

140  
120  
100  
80  
60  
40



- 56 -

F786  
King Salmon  
Catch/man/day  
Middle Yukon District

1960

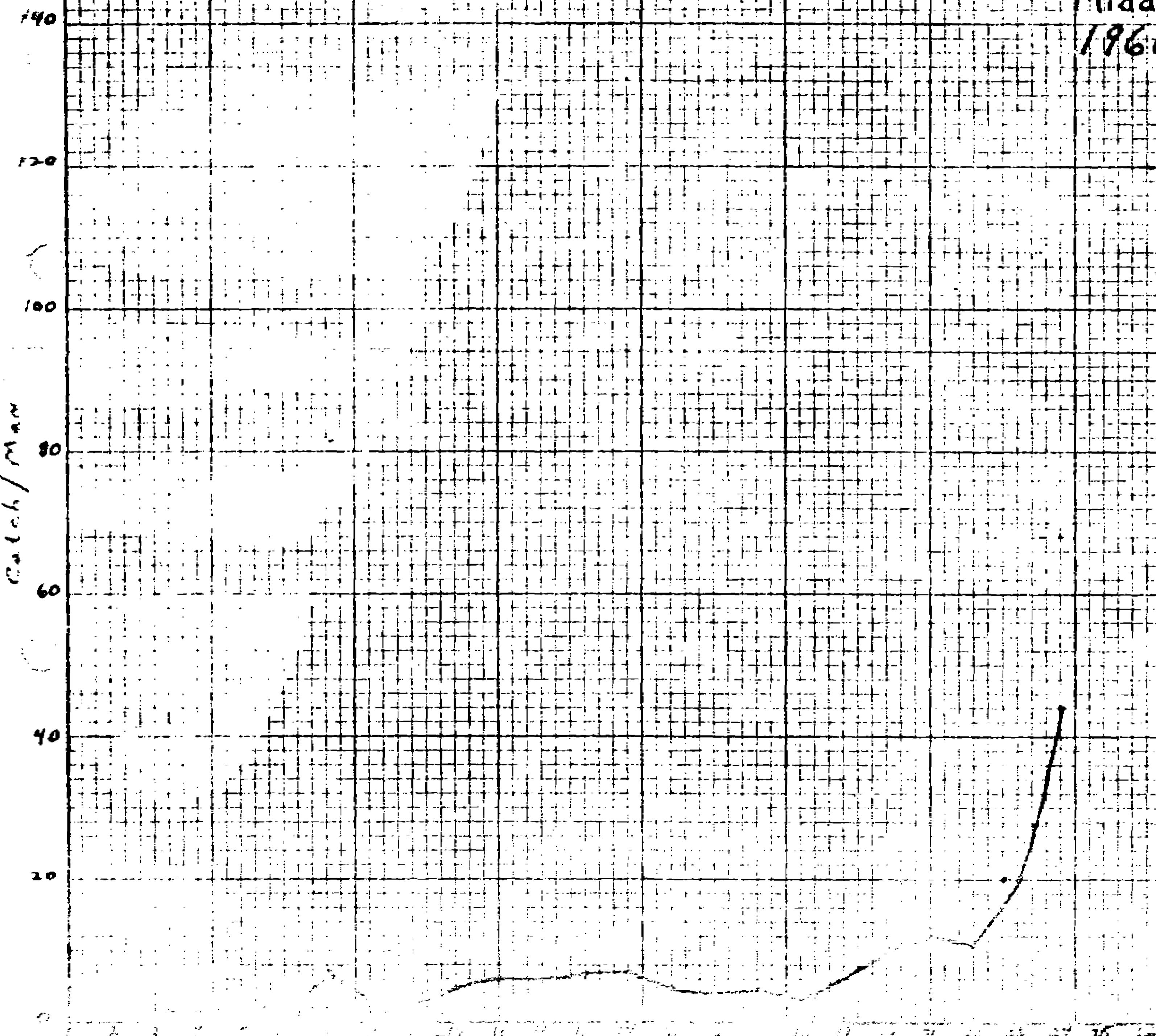
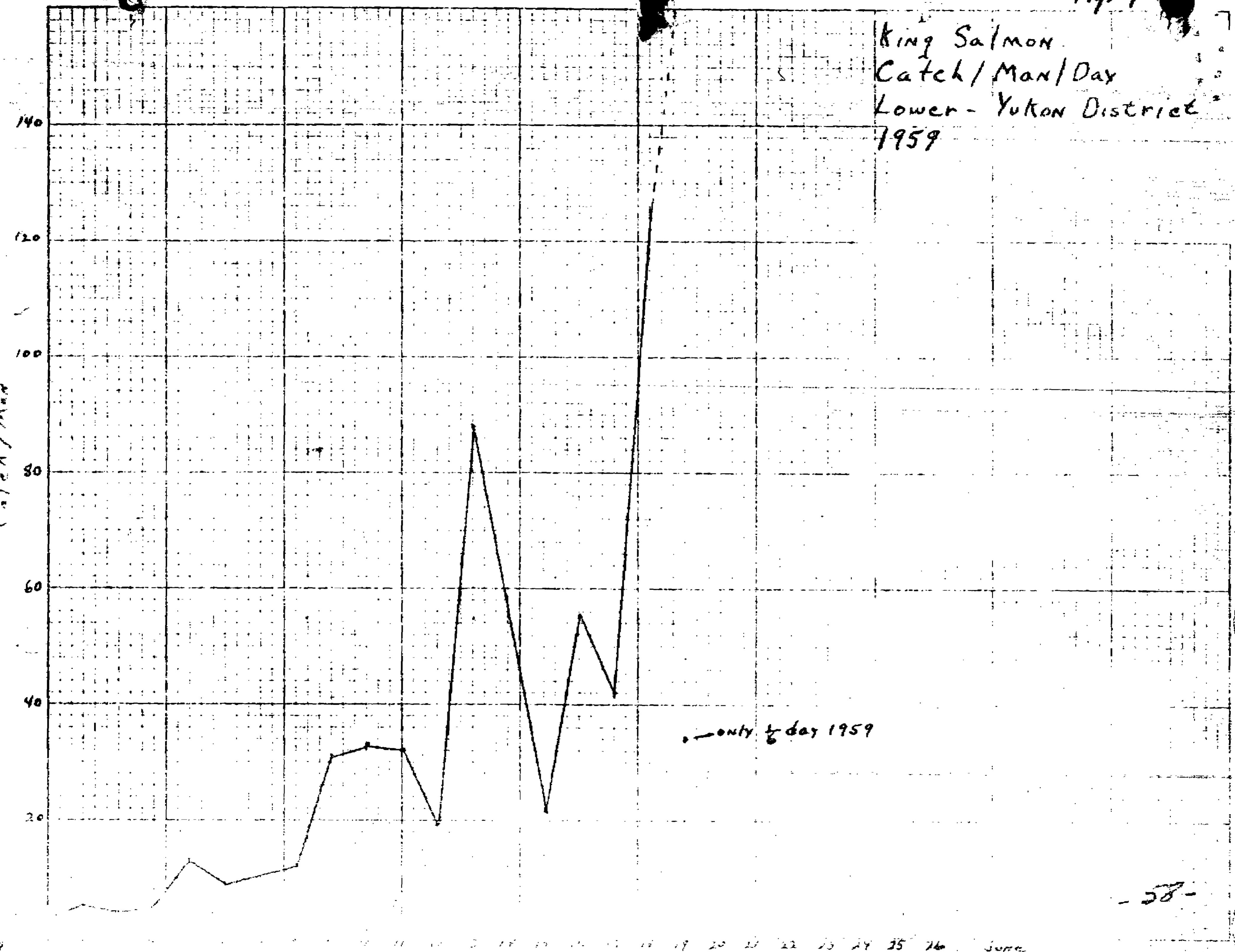


Fig. 7

King Salmon  
Catch / Man / Day  
Lower - Yukon District  
1959



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